to make 100. By trial we find that $\frac{3}{5}\times 8+\frac{68}{5}\times 7=100$. Hence, multiplying the column of 8 by $\frac{3}{5}$ and the column of 7 by $\frac{68}{5}$ and adding the results horizontally, we get 3 lambs, 68 sheep, and 29 hogs and calves. In like manner, by multiplying the column of 8 by $\frac{10}{5}$ and the column of 7 by $\frac{60}{5}$, we get 10 lambs, 60 sheep, and 30 hogs and calves. By multiplying by $\frac{17}{5}$ and $\frac{52}{5}$ respectively, we get 17 lambs, 52 sheep, and 31 hogs and calves. The remaining six answers may now be easily written down without further trial. Since, in the first result there are 29 hogs and calves, we may have 1 hog and 28 calves, and so on. In all we may have 28 different results. In like manner in the second result, we may have 29 different results. In like manner 30 in third, 31 in fourth, 32 in the fifth, 33 in the sixth, 34 in the seventh, 35 in the eighth and 36 in the ninth. Hence, in all, we have $28+29+30+31+32+33+34+35+36=288$ different results.

For a fuller treatment of this class of problems see my *Mathematical Solution Book*.

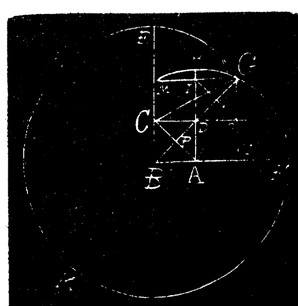
Correct solutions to this problem were received from *H. J. Geartner Martin Spinx, John McDowell, P. S. Berg, P. C. Cullen, and M. A. Gruber. Mr. Gruber also gave a solution by Algebra.*

32. Proposed by P. C. CULLEN, Meade, Nebraska.

A horse is tied to a corner of a building 40 feet square, by a rope 110 feet long. Over how much land can he graze?

Solution by MARTIN SPINX, Wilmington, Ohio; Professor A. J. LILLY, Algona, Iowa; and Professor H. J. GEARTNER, Wilmington, Ohio.

Let $ABCD$ represent the barn, side $AB=40$ feet; BE represent the rope, length 110 feet; and $CG=70$ feet. Then the area of $FBEKF=\frac{3}{4}\pi\times 110^2$ $=28510.02$ sq. feet. The area of the two equal quadrants $AFGH$ and $CLGE$ $=\frac{1}{2}\pi 70^2=7696.84$ sq. feet. Now $AC=40\sqrt{2}$ feet; $PG=\sqrt{(GC^2-PC^2)}$ $=\sqrt{(70^2-800)}=10\sqrt{41}$ feet; and $DG=10\sqrt{41}$ $-20\sqrt{2}=10[\sqrt{41}-2\sqrt{2}]$ feet. $\therefore$ Area of square $ODIG=GD^2\div 2=\{10[\sqrt{41}-2\sqrt{2}]\}^2$ $\div 2=638.922932$ sq. ft. The height of the segment GNL is $LO=LD-OD=30$ feet$-\frac{1}{2}\sqrt{2}$ $GD=[30-(5\sqrt{82}-20)]$ feet$=5[10-\sqrt{82}]$ feet and the base is $GN=2GO=\sqrt{2}GD$ $10[\sqrt{82}-4]$ feet. Hence, according to the rule, p. 389, Ray's Higher Arithmetic, the area of the segments GNL and GMH is $2(LO^3\div 2GN+\frac{2}{3}LO\times GN)$ $=2\{[5(10-\sqrt{82})]^3\div 20[\sqrt{82}-4]+\frac{2}{3}\times 5(10-$ $\sqrt{82})\times[10\sqrt{82}-4]\}=320.443888$ sq. ft. and the area of the half segments$=160.221944$ sq. ft. Hence, the area over which the horse grazes$=\frac{3}{4}FBEKF+FAH+LCE-(LOG+ODIG+GIH)=\frac{3}{4}\pi 110^2$ $+\frac{1}{2}\pi 70^2-(160.221944+638.922932)=35407.72514$ sq. ft.



This problem was solved in different ways and with different results by *P. S. BERG, John McDowell, G. B. M. Zerr, and D. G. Durrance.*

[For a demonstration of the rule referred to above, see my *Mathematical Solution-Book*, pp. 201 and 202.—Ed.]